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5. ☐ 10/9/5 (Item 5 from file: 35)

01770952 ORDER NO: AADAA-IC802265

**Evolutionary algorithms for multiobjective optimization: Methods and applications**

**Author:** Zitzler, Eckart

**Degree:** Dr.sc.techn.

**Year:** 2000

**Corporate Source/Institution:** Eidgenoessische Technische Hochschule Zuerich (Switzerland) ( 0663 )

**Source:** Volume 6102C of Dissertations Abstracts International.

PAGE 567 . 136 PAGES

**Descriptors:** COMPUTER SCIENCE

**Descriptor Codes:** 0984

**ISBN:** 3-8265-6831-1

**Publisher:** Shaker Verlag GmbH, P.O. Box 1290, D-52013 Aachen, Germany

Many real-world problems involve two types of problem difficulty: (i) multiple, conflicting objectives and (ii) a highly complex search space. On the one hand, instead of a single optimal solution competing goals give rise to a set of compromise solutions, generally denoted as Pareto-optimal. In the absence of preference information, none of the corresponding trade-offs can be said to be better than the others. On the other hand, the search space can be too large and too complex to be solved by exact methods. Thus, efficient optimization strategies are required that are able to deal with both difficulties.

Evolutionary algorithms possess several characteristics that are desirable for this kind of problem and make them preferable to classical optimization methods. In fact, various evolutionary approaches to multiobjective optimization have been proposed since 1985, capable of searching for multiple Pareto-optimal solutions concurrently in a single simulation run. However, in spite of this variety, there is a lack of extensive comparative studies in the literature. Therefore, it has remained open up to now: (1) whether some techniques are in general superior to others, (2) which algorithms are suited to which kind of problem, and (3) what the specific advantages and drawbacks of certain methods are.

The subject of this work is the comparison and the improvement of existing multiobjective evolutionary algorithms and their application to system design problems in computer engineering. In detail, the major contributions are: (1) An experimental methodology to compare multiobjective optimizers is developed. In particular, quantitative measures to assess the quality of trade-off fronts are introduced and a set of general test problems is defined, which are (i) easy to formulate, (ii) represent essential aspects of real-world problems, and (iii) test for different types of problem difficulty. (2) On the basis of this methodology, an extensive comparison of numerous evolutionary techniques is performed in which further aspects such as the influence of elitism and the population size are also investigated. (3) A novel approach to multiobjective optimization, the strength Pareto evolutionary algorithm, is proposed. It combines both established and new techniques in a unique manner. (4) Two complex multicriteria applications are addressed using evolutionary algorithms: (i) the automatic synthesis of heterogeneous hardware/systems and (ii) the multidimensional exploration of software implementations for digital signal processors.

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16997954 PASCAL No.: 05-0058908

Optimal VAR dispatch using a multiobjective evolutionary algorithm

2005

English Descriptors: Electrical network; Dispatching problem; Reactive power; Optimal conditions; Optimization method; Evolutionary algorithm; Pareto optimum; Multiobjective programming; Nonlinear problems; Constrained optimization; Power losses; Cluster model; Hierarchical system; Fuzzy set theory; Optimal solution; Performance evaluation; Experimental result

French Descriptors: Reseau electrique; Probleme livraison; Puissance reactive; Regime optimal; Methode optimisation; Algorithme evolutionniste; Optimum Pareto; Programmation multiobjectif; Probleme non lineaire; Optimisation sous contrainte; Perte puissance; Modele amas; Systeme hierarchise; Theorie ensemble flou; Solution optimale; Evaluation performance; Resultat experimental

Classification Codes: 001D05I01B; 001D05I01H

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16876274 PASCAL No.: 04-0537417

SPEA2+: Improving the performance of the strength pareto evolutionary algorithm 2

PPSN VIII : parallel problem solving from nature : Birmingham, 18-22 September 2004

2004

English Descriptors: Problem solving; Biomimetics; Parallelism; Archive; Pareto optimum; Evolutionary algorithm; Genetic algorithm; Multiobjective programming; Optimization method; Mathematical programming

French Descriptors: Resolution probleme; Biomimetique; Parallelisme; Archive; Optimum Pareto; Algorithme evolutionniste; Algorithme genetique; Programmation multiobjectif; Methode optimisation; Programmation mathematique

Classification Codes: 001D02A05; 001D02C02

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93. ☐ 10/8/93 (Item 14 from file: 144)

16806798 PASCAL No.: 04-0464281

A multicast routing algorithm using multiobjective optimization  
Telecommunications and networking : Fortaleza, 1-6 August 2004

2004

English Descriptors: Multicast; Routing; Evolutionary algorithm;  
Multiobjective programming; Computer network; Delay time; Optimization; A  
priori estimation; Simulation; Pareto optimum; Optimal solution; Shortest  
path; Data broadcast

French Descriptors: Multidestinataire; Routage; Algorithme évolutionniste;  
Programmation multiobjectif; Réseau ordinateur; Temps retard;  
Optimisation; Estimation a priori; Simulation; Optimum Pareto; Solution  
optimale; Plus court chemin; Diffusion donnée

Classification Codes: 001D04B02G; 001D04B03B

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94. ☐ 10/8/94 (Item 15 from file: 144)

16805762 PASCAL No.: 04-0463168

Multiobjective multicast routing algorithm  
Telecommunications and networking : Fortaleza, 1-6 August 2004

2004

English Descriptors: Multiobjective programming; Multicast; Routing;  
Evolutionary algorithm; Delay time; Optimal solution; A priori estimation  
; Simulation; Pareto optimum; Teletraffic; Performance evaluation;  
Shortest path; Data broadcast

French Descriptors: Programmation multiobjectif; Multidestinataire; Routage  
; Algorithme évolutionniste; Temps retard; Solution optimale; Estimation  
a priori; Simulation; Optimum Pareto; Teletrafic; Evaluation performance;  
Plus court chemin; Diffusion donnée

Classification Codes: 001D04B02G; 001D04B02B

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95. ☐ 10/8/95 (Item 16 from file: 144)

16351288 PASCAL No.: 03-0517481

Reducing the run-time complexity of multiobjective EAs: The NSGA-II and other algorithms

2003

English Descriptors: Algorithm complexity; Time complexity; Genetic algorithm; Pareto optimum; Data structure; Evolutionary algorithm; Optimization; Multiobjective programming; Evolutionary computation; Optimality criterion

French Descriptors: Complexite algorithmne; Complexite temps; Algorithme genetique; Optimum Pareto; Structure donnee; Algorithme evolutionniste; Optimisation; Programmation multiobjectif; Calcul evolutionniste; Critere optimalite

Classification Codes: 001D02A05

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96. ☐ 10/8/96 (Item 17 from file: 144)

16225368 PASCAL No.: 03-0386007

Balance between genetic search and local search in memetic algorithms for multiobjective permutation flowshop scheduling  
Evolutionary multiobjective optimization

2003

English Descriptors: Pareto optimum; Optimization; Flow shop; Evolutionary algorithm; Scheduling; Multiobjective programming; Search algorithm; Genetic algorithm; Hybridization; Local search

French Descriptors: Optimum Pareto; Optimisation; Atelier monogamme; Algorithme evolutionniste; Ordonnancement; Programmation multiobjectif; Algorithme recherche; Algorithme genetique; Hybridation; Recherche locale

Classification Codes: 001D01A04; 001D02A05

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97. ☐ 10/8/97 (Item 18 from file: 144)

16109224 PASCAL No.: 03-0267684

Multi-criteria airfoil design with evolution strategies

EMO 2003 : evolutionary multi-criterion optimization : Faro, 8-11 April 2003

2003

English Descriptors: Aerofoil; Numerical method; Two dimensional model; Navier Stokes equation; Optimization; Mathematical programming; Pareto optimum; Evolutionary algorithm; Multiobjective programming; Genetic algorithm; Multicriteria analysis

French Descriptors: Profil aerodynamique; Methode numerique; Modele 2 dimensions; Equation Navier Stokes; Optimisation; Programmation mathematique; Optimum Pareto; Algorithme evolutionniste; Programmation multiobjectif; Algorithme genetique; Analyse multicritere; 4785G

Classification Codes: 001D01A03; 001B40G85B

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98. ☐ 10/8/98 (Item 19 from file: 144)

16108509 PASCAL No.: 03-0266857

Multiobjective evolutionary algorithms applied to the rehabilitation of a water distribution system: A comparative study

EMO 2003 : evolutionary multi-criterion optimization : Faro, 8-11 April 2003

2003

English Descriptors: Mathematical programming; Multiobjective programming; Evolutionary algorithm; Genetic algorithm; Pareto optimum; Decision support system; Water distribution; Water supply; Rehabilitation

French Descriptors: Programmation mathematique; Programmation multiobjectif ; Algorithme evolutionniste; Algorithme genetique; Optimum Pareto; Systeme aide decision; Distribution eau; Approvisionnement eau; Rehabilitation

Classification Codes: 001D01A03; 001D14I03; 295

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99. ☐ 10/8/99 (Item 20 from file: 144)

16051962 PASCAL No.: 03-0200510

Multiobjective Evolutionary algorithm for the optimization of noisy combustion processes

2002

English Descriptors: Availability; Robustness; Combustion; Instability; Emission; Reduction; Evolutionary algorithm; Multiobjective programming;

Optimization method; Noise; Objective function; Numerical method;  
Modeling; Optimization; Outlier; Pareto optimum; Genetic algorithm  
French Descriptors: Disponibilite; Robustesse; Combustion; Instabilite;  
Emission; Reduction; Algorithme evolutionniste; Programmation  
multiobjectif; Methode optimisation; Bruit; Fonction objectif; Methode  
numerique; Modelisation; Optimisation; Observation aberrante; Optimum  
Pareto; Algorithme genetique  
Classification Codes: 001D01A02; 001A02I01P1; 001D02D13

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100. ☐ 10/8/100 (Item 21 from file: 144)

16022265 PASCAL No.: 03-0169006

Multi-objective optimization evolutionary algorithms applied to  
Paroxysmal Atrial Fibrillation diagnosis based on the k-nearest neighbours  
classifier

IBERAMIA 2002 : advances in artificial intelligence : Seville, 12-15  
November 2002

2002

English Descriptors: Pareto optimum; Genetic algorithm; Nearest neighbour;  
Classification; Evolutionary algorithm; Optimization; Multiobjective  
programming; Classifier

French Descriptors: Optimum Pareto; Algorithme genetique; Plus proche  
voisin; Classification; Algorithme evolutionniste; Optimisation;  
Programmation multiobjectif; Classificateur

Classification Codes: 001D01A04

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101. ☐ 10/8/101 (Item 22 from file: 144)

15493278 PASCAL No.: 02-0188596

A new multiobjective evolutionary algorithm

2002

English Descriptors: Strength Pareto evolutionary algorithms (SPEA); Theory  
; Vectors; Set theory; Pareto principle; Benchmarking; Computational  
methods; Combinatorial mathematics; Evolutionary algorithms

French Descriptors: Theorie; Vecteur; Theorie ensemble; Principe Pareto;  
Benchmarking; Methode calcul; Mathematiques combinatoires; Algorithme  
evolutionniste

Classification Codes: 001D02B; 001A02; 001A02D; 001A02B

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102. ☐ 10/8/102 (Item 23 from file: 144)

15069623 PASCAL No.: 01-0228632

Microchannel optimization using multiobjective evolution strategies

EMO 2001 : evolutionary multi-criterion optimization : Zurich, 7-9 March  
2001

2001

English Descriptors: Sequencing; Miniaturization; Genetic algorithm;  
Fluidics; Evolutionary algorithm; Pareto optimum; Optimization;  
Multiobjective programming; Microfluid

French Descriptors: Sequencage; Miniaturisation; Algorithme genetique;  
Fluidique; Algorithme evolutionniste; Optimum Pareto; Optimisation;  
Programmation multiobjectif; Microfluide

Classification Codes: 001D01A02

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**103. ☐ 10/8/103 (Item 24 from file: 144)**

14841878 PASCAL No.: 00-0525710

On the assessment of multiobjective approaches to the adaptive distributed database management problem

PPSN VI : parallel problem solving from nature : Paris, 18-20 September 2000

2000

English Descriptors: Database management system; Distributed database;

Evolutionary algorithm; Adaptive algorithm; Algorithm performance

French Descriptors: Systeme gestion base donnee; Base donnee repartie;

Algorithme evolutionniste; Algorithme adaptatif; Performance algorithme

Classification Codes: 001D02C05; 001D02B07D

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**Dialog eLink:**[open url](#)**104. ☐ 10/8/104 (Item 1 from file: 99)****2606604 H.W. Wilson Record Number: BAST03116634****Multiobjective Evolutionary Algorithm for the Optimization of Noisy Combustion Processes**

**Descriptors:** Gas turbines--Combustion; Evolutionary computation; Multiple criteria decision making ; 20021100

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74. ☐ 10/9/74 (Item 63 from file: 2)

08018247 **INSPEC Abstract Number:** C2001-10-1180-024

**Title:** PDE: a Pareto-frontier differential evolution approach for multi-objective optimization problems

**Author** Abbass, H.A.; Sarker, R.; Newton, C.

**Author Affiliation:** Sch. of Comput. Sci., New South Wales Univ., Canberra, ACT, Australia

**Conference Title:** Proceedings of the 2001 Congress on Evolutionary Computation (IEEE Cat. No.01TH8546) **Part** vol. 2 p. 971-8 vol. 2

**Publisher:** IEEE , Piscataway, NJ, USA

**Publication Date:** 2001 **Country of Publication:** USA 2 vol. (xii+1441) pp.

**ISBN:** 0 7803 6657 3 **Material Identity Number:** XX-2001-01452

**U.S. Copyright Clearance Center Code:** 0 7803 6657 3/2001/\$10.00

**Conference Title:** Proceedings of the 2001 Congress on Evolutionary Computation

**Conference Date:** 27-30 May 2001 **Conference Location:** Seoul, South Korea

**Language:** English **Document Type:** Conference Paper (PA)

**Treatment:** Theoretical (T)

**Abstract:** The use of evolutionary algorithms (EAs) to solve problems with multiple objectives (known as multi-objective optimization problems (MOPs)) has attracted much attention. Being population based approaches, EAs offer a means to find a group of Pareto-optimal solutions in a single run. Differential evolution (DE) is an EA that was developed to handle optimization problems over continuous domains. The objective of this paper is to introduce a novel Pareto-frontier differential evolution (PDE) algorithm to solve MOPs. The solutions provided by the proposed algorithm for two standard test problems, outperform the Strength Pareto Evolutionary Algorithm, one of the state-of-the-art evolutionary algorithms for solving MOPs. ( 15 Refs)

**Subfile:** C

**Descriptors:** evolutionary computation

**Identifiers:** Pareto-frontier differential evolution; multi-objective optimization problems; evolutionary algorithms; Strength Pareto Evolutionary Algorithm; continuous domains

**Class Codes:** C1180 (Optimisation techniques)

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61. ☐ 10/8/61 (Item 50 from file: 2)

08962662 **INSPEC Abstract Number:** B2004-06-8110B-071

**Title:** Environmental/economic power dispatch using multiobjective evolutionary algorithms

**Publication Date:** 2003

**Medium:** Also available on CD-ROM in PDF format

**Document Type:** Conference Paper (PA)

**Treatment:** Economic aspects (E); Practical (P); Theoretical (T)

**Descriptors:** convergence; decision making; evolutionary computation; fuzzy set theory; load dispatching; Pareto optimisation; power system economics

**Identifiers:** multiobjective evolutionary algorithm; environmental-economic power dispatch problem; nonlinear constrained multiobjective optimization problem ; strength Pareto evolutionary algorithm; diversity-preserving mechanism; convergence; search bias problems; hierarchical clustering algorithm; decision maker; Pareto-optimal set; fuzzy set theory

**Class Codes:** B8110B (Power system management, operation and economics); B0250 ( Combinatorial mathematics); B0260 (Optimisation techniques)

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62. ☐ 10/8/62 (Item 51 from file: 2)

08948112 **INSPEC Abstract Number:** B2004-06-8110C-025, C2004-06-3340H-069

**Title:** A novel multiobjective evolutionary algorithm for optimal reactive power dispatch problem

**Document Type:** Conference Paper (PA)

**Treatment:** Theoretical (T)

**Descriptors:** evolutionary computation; Pareto optimisation; power generation dispatch; reactive power control

**Identifiers:** multiobjective evolutionary algorithm; optimal reactive power dispatch problem; nonlinear constrained optimization; real power loss; bus voltage deviations; strength Pareto evolutionary algorithm; competing objectives; noncommensurable objectives; hierarchical clustering algorithm; reactive power control

**Class Codes:** B8110C (Power system control); B0260 (Optimisation techniques); C3340H ( Control of electric power systems); C3110E (Power and energy control); C1180 (Optimisation techniques); C1230 (Artificial intelligence)

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63. ☐ 10/8/63 (Item 52 from file: 2)

08914241 **INSPEC Abstract Number:** C2004-05-1180-024

**Title:** ISPEA: improvement for the strength Pareto evolutionary algorithm for multiobjective optimization with immunity

**Publication Date:** 2003

**Document Type:** Conference Paper (PA)

**Treatment:** Theoretical (T)

**Descriptors:** evolutionary computation; operations research; Pareto optimisation

**Identifiers:** ISPEA; multiobjective evolutionary algorithm; MOEA; strength Pareto evolutionary algorithm; SPEA; multiobjective optimization; Pareto-optimal set; evolution process

**Class Codes:** C1180 (Optimisation techniques); C1290 (Applications of systems theory)

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64. ☐ 10/8/64 (Item 53 from file: 2)

08882684 **INSPEC Abstract Number:** C2004-04-4240P-008

**Title:** Parallel single front genetic algorithm: performance analysis in a cluster system

**Publication Date:** 2003

**Document Type:** Conference Paper (PA)

**Treatment:** Applications (A); Practical (P)

**Descriptors:** evolutionary computation; genetic algorithms; parallel algorithms; performance evaluation; workstation clusters

**Identifiers:** parallel single front genetic algorithm; performance Analysis; cluster system; strength Pareto evolutionary algorithm; parallel evolutionary optimizer

**Class Codes:** C4240P (Parallel programming and algorithm theory); C1180 (Optimisation techniques); C4220 (Automata theory); C5620L (Local area networks)

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65. ☐ 10/8/65 (Item 54 from file: 2)

08801470 **INSPEC Abstract Number:** B2004-01-8110B-034

**Title:** Environmental/economic power dispatch using multiobjective evolutionary algorithms

**Publication Date:** Nov. 2003

**Document Type:** Journal Paper (JP)

**Treatment:** Economic aspects (E); Theoretical (T)

**Descriptors:** evolutionary computation; fuzzy set theory; Pareto optimisation; power generation dispatch; power generation economics

**Identifiers:** economic power dispatch; environmental power dispatch; multiobjective evolutionary algorithms; environmental/economic power dispatch; nonlinear constrained multiobjective optimization; strength Pareto evolutionary algorithm; diversity-preserving mechanism; premature convergence; search bias problems; hierarchical clustering algorithm; decision maker; Pareto-optimal set; fuzzy set theory; standard test system; well-distributed Pareto-optimal solutions

**Class Codes:** B8110B (Power system management, operation and economics); B8200 (Generating stations and plants); B0260 (Optimisation techniques); B0250 (Combinatorial mathematics)

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66. ☐ 10/8/66 (Item 55 from file: 2)  
08685023 INSPEC Abstract Number: B2003-08-7510D-133, C2003-08-7330-437  
**Title:** Multi-objective optimization evolutionary algorithms applied to paroxysmal atrial fibrillation diagnosis based on the k-nearest neighbours classifier  
**Publication Date:** 2002  
**Document Type:** Conference Paper (PA)  
**Treatment:** Practical (P); Experimental (X)  
**Descriptors:** electrocardiography; genetic algorithms; medical diagnostic computing; medical signal processing  
**Identifiers:** paroxysmal atrial fibrillation; PAF; k-nearest neighbours classifier; multiobjective optimization; classification rate optimal combinations; sensibility optimal combinations; specificity optimal combinations; Single Front Genetic Algorithm; SFGA; New Single Front Genetic Algorithm; NSFGA; Strength Pareto Evolutionary Algorithm; SPEA; hypervolume metric; combinatorial scanning techniques; multiobjective optimization problems; MOP; pareto optimal solutions; secondary population; adequate diversity maintenance techniques; heart arrhythmia; cerebrovascular accidents; electrocardiogram traces; ECG  
**Class Codes:** B7510D (Bioelectric signals); B0260 (Optimisation techniques); C7330 (Biology and medical computing); C5260 (Digital signal processing); C1180 (Optimisation techniques)  
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67. ☐ 10/8/67 (Item 56 from file: 2)  
08617180 INSPEC Abstract Number: C2003-06-1180-034  
**Title:** Balance between genetic search and local search in memetic algorithms for multiobjective permutation flowshop scheduling  
**Publication Date:** April 2003  
**Document Type:** Journal Paper (JP)  
**Treatment:** Applications (A); Bibliography (B); Theoretical (T)  
**Descriptors:** genetic algorithms; probability; production control; search problems  
**Identifiers:** evolutionary multiobjective optimization; genetic local search; memetic algorithms; permutation flowshop scheduling; local search; Pareto evolutionary algorithm; nondominated sorting genetic algorithm; probability ; hybridization  
**Class Codes:** C1180 (Optimisation techniques); C1290F (Systems theory applications in industry); C1140Z (Other topics in statistics)  
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68. ☐ 10/8/68 (Item 57 from file: 2)  
08537424 INSPEC Abstract Number: C2003-04-3340B-001  
**Title:** Multiobjective evolutionary algorithm for the optimization of noisy combustion processes  
**Publication Date:** Nov. 2002  
**Document Type:** Journal Paper (JP)  
**Treatment:** Theoretical (T)

**Descriptors:** combustion; emission; gas turbines; genetic algorithms

**Identifiers:** combustion processes; Pareto optimization; emission reduction; evolutionary algorithms; pressure fluctuations; gas turbine; multiobjective optimization ; noisy objective functions

**Class Codes:** C3340B (Control of heat systems); C1180 (Optimisation techniques)

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69. ☐ 10/8/69 (Item 58 from file: 2)

08347857 **INSPEC Abstract Number:** B2002-09-0260-035, C2002-09-1180-045

**Title:** Evaluation of genetic algorithm for objective computation methods

**Publication Date:** April 2002

**Document Type:** Journal Paper (JP)

**Treatment:** Theoretical (T)

**Descriptors:** genetic algorithms; knapsack problems; search problems

**Identifiers:** searching ability; multiobjective computation methods; nondominated sorting genetic algorithm-II; strength Pareto evolutionary algorithm-II; master-slave model with local cultivation model; multi-objective genetic algorithms with distributed environment scheme; knapsack problems

**Class Codes:** B0260 (Optimisation techniques); C1180 (Optimisation techniques)

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08320301 **INSPEC Abstract Number:** B2002-08-8110-030

**Title:** Multi-objective reactive power compensation

**Publication Date:** 2001

**Document Type:** Conference Paper (PA)

**Treatment:** Theoretical (T); Experimental (X)

**Descriptors:** compensation; evolutionary computation; investment; losses; optimisation; Pareto distribution; power transmission; reactive power

**Identifiers:** multi-objective reactive power compensation; constrained single-objective optimization problem; linear combination; investment; transmission losses; reliability profile; voltage profile; multi-objective optimization evolutionary algorithms; Pareto set; Pareto solutions; Pareto front; strength Pareto evolutionary algorithm

**Class Codes:** B8110 (Power systems); B0260 (Optimisation techniques); B8120 (Power transmission, distribution and supply); B0240Z (Other topics in statistics)

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